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ABSTRACT

Using the Biomedical Sciences Preparatory Program (BioPrep) for illustration, this paper discusses an approach to educational improvement through the development of curriculum that emphasizes experiential learning and the involvement of students in real-life problems. Opening sections describe BioPrep, a program designed to prepare rural high school students for success in college and to encourage them to enter a health sciences career that they will practice in rural Alabama. Components of the BioPrep curriculum development model are defined. They include factors such as curriculum materials, staff development, direct instruction, and individualized study. The paper then discusses the formal cooperative partnership between the University of Alabama and the target schools that implement the BioPrep program. Emphasis is placed on joint responsibility for program development, cooperative problem solving, and the problems and strengths of rural schools. The remainder of the paper covers the development of the BioPrep ninth grade curriculum and the structure and use of the teacher's learning activity guide. Prepared for primary use in the ninth grade biology course, the guide can also be used for an interdisciplinary curriculum incorporating English, math, and social studies. The appendix contains introductory sections of the guide and a complete unit on the basic life processes. (JHZ)

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A MODEL FOR CURRICULUM DEVELOPMENT IN RURAL SCHOOLS

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ABSTRACT

A MODEL FOR CURRICULUM DEVELOPMENT IN RURAL SCHOOLS

The problems obstructing improvement of the quality of education in rural schools occur on several different levels. The multi-faceted mixture of educational deficiences in these schools requires diversified intervention, not only in curriculum development as it is traditionally viewed, but in a range of additional areas that affect the social ecology of learning. This paper describes the principles underlying this approach to educational improvement, focusing on experiential learning strategies and the direct involvement of students in real-life problems and processes, utilizing the integrated ninth grade curricula of BioPrep for illustration.

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A MODEL FOR CURRICULUM DEVELOPMENT IN RURAL SCHOOLS

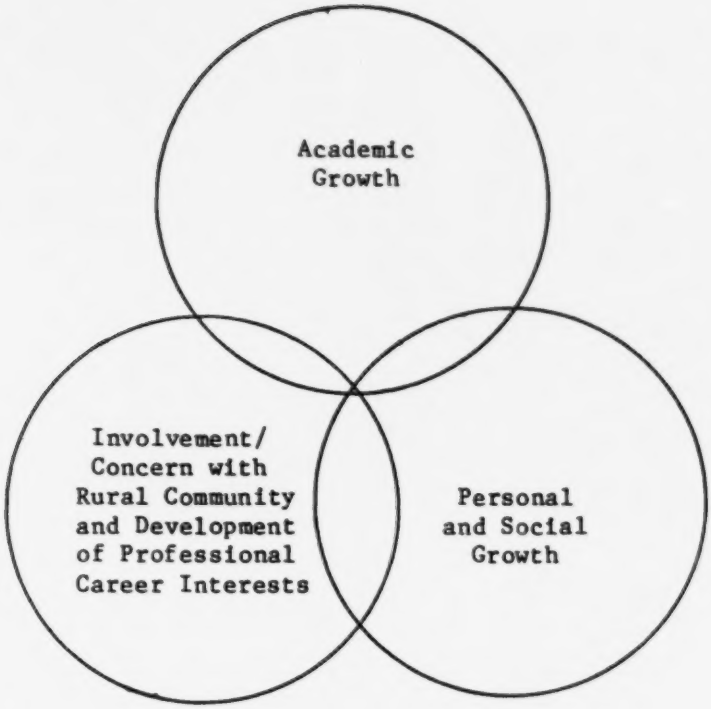
The scope of curriculum development in the BioPrep program is aimed at student growth in several dimensions and in an integrated fashion. The formal objectives of BioPrep, generally stated, involve preparing students academically for admission and successful progression through college, increasing their knowledge and understanding about elements of the health care system, and developing their awareness and appreciation for the values of rural living - all with an emphasis toward careers in biomedical sciences and professional practice in rural areas.

If the BioPrep emphasis on biomedical careers is viewed as being flexible or interchangeable so as to accommodate curricular attention to other career roles, then these objectives are adaptable for improving the quality of education in practically any rural school system. This fact is the initial basis for proposing the BioPrep curriculum process as a generalized model for rural schools. Further reasons are associated with additional aspects of the BioPrep program.

While integrated growth is not a new idea in public education, a brief look at how this aim is conceptualized for BioPrep may be helpful in discussing the BioPrep approach to curriculum development.

Curriculum Aims

For purposes of organizing curricular assistance to project schools, BioPrep program outcomes were categorized generally into three areas, protrayed in diagram below.



Integrated Student Development

For project staff concerned with methods of how students are being educated, this scheme, and particularly the dimension of student involvement with the rural community, served as a reminder of the broader purposes of why students are being educated. In developing improved curricula, attention was therefore given to aspects of both cognitive and affective learning to motivate student academic performance and also contribute to the development of students as useful participants in the community.

For example, BioPrep classroom studies are often linked with community-based investigations whereby students learn academic content in applied fashion along with attributes of social competence. Meaningful

learning is therefore acquired in such intellectual skill areas as critical thinking and problem solving together with such personal capabilities as ethical judgment and self expression. A prevailing theme for program outcomes is to instill an active appreciation for the important connection between functional skills in life, such as analyzing, computing, and communicating, and the form and substance of life, such as art, the natural environment, and career professions.

An early concern was that of building in students the sort of natural curiosity and sense of wonder that stimulates interest and has traditionally motivated scientific careers. In this vein, deliberate effort is made to demonstrate subject matter as it is relevant to aspects of daily life that are meaningful to students. Closely aligned with this concern is the importance of developing decision-making skills for successful participation in a changing society and world.

It has been said that two of the greatest needs in the world today are for human understanding, particularily at the international/intercultural level, and for environmental understanding. If these can be considered among the broader purposes of education, then the BioPrep program is addressing these responsibilities readily.

From the ninth grade on, the BioPrep health care focus has encorporated a perspective of caring for the health of the overall community of life, including other cultures and species. Also, such characteristics as humanity, sensitivity, and social conciousness are included in the personal and social growth category of program aims, and are nurtured persistently in both the science and humanities areas. In addition, the rural appreciation component of BioPrep provides a prime area

for sensitizing students to social and ecological relationships and to interactions between the two.

In sum, the integrated outcomes of the accelerated BioPrep curriculum are aimed at student growth that is rounded or holistic. The concerns and aims of the BioPrep program will be treated further in later sections examining more closely the curriculum development process.

BioPrep Curriculum Overview

Program objectives are pursued by means of a four-year curriculum sequence that gears accelerated content to student needs and capabilities as determined by BioPrep staff. These determinations and any adjustments that may prove necessary during the school year are made in collaboration with parents, teachers, and other school personnel, including students themselves in appropriate instances.

The main framework for the curricula sequence involves students in accelerated coursework through a variety of formal and informal educational activities beginning in the ninth grade and ending in the twelfth. In addition to the regular curriculum, these are conducted via special weekday, weekend, and summer programs, and involve students in such activities as directed and independent study, lab and field experiences, field placements, and tutorials. A fifth project year is planned to follow the pilot students into the first year of their undergraduate studies and provide both evaluation of the preceding four years preparation as well as continued counseling and tutorial opportunities as they commence their undergraduate college education.

Where possible, superior texts and materials are selected prior to the beginning of the school year and additional activities and learning guides are developed where necessary to supplement the regular curricula.

The first four years curricula are administered in the context of three separate but interdependent tracks.

The first track is comprised of complementary and supplementary education experiences in the sciences and mathematics designed to parellel standard curricular offerings in the three county school systems. The second track, the "Health Care System," is comprised of didactic and experiential activities that complement the science and mathematics coursework of each grade level and introduce students to the nature, scope, processes, and procedures of the health care system and its parts. The third track provides complementary and supplementary didactic and experiential activities in verbal and written skills. Each of the tracks consists of content and experiences that are progressive in nature, i.e., the content and experiences of one level are based upon and relate directly to that of the previous level.

In addition, the three tracks at any one level are interrelated so that, for example, in the ninth grade there was scheduled as a complementary science experience a course in health care that related directly to the physical science courses taught at the ninth grade level in each of the three county school systems. In turn, this course related to the activities in the "Health Care System" track wherein students were introduced to the health care systems and health careers. Finally, the major activities in the third track, verbal and written skills, used the subject content of the first two tracks as the basis for required written and oral presentations. Underlying activities in all three tracks, and emphasized in specific activities in the health care and communication tracks, was a focus on rural values and rural development in which problems

and assignments stress the potential of rural areas and the advantages of rural living.

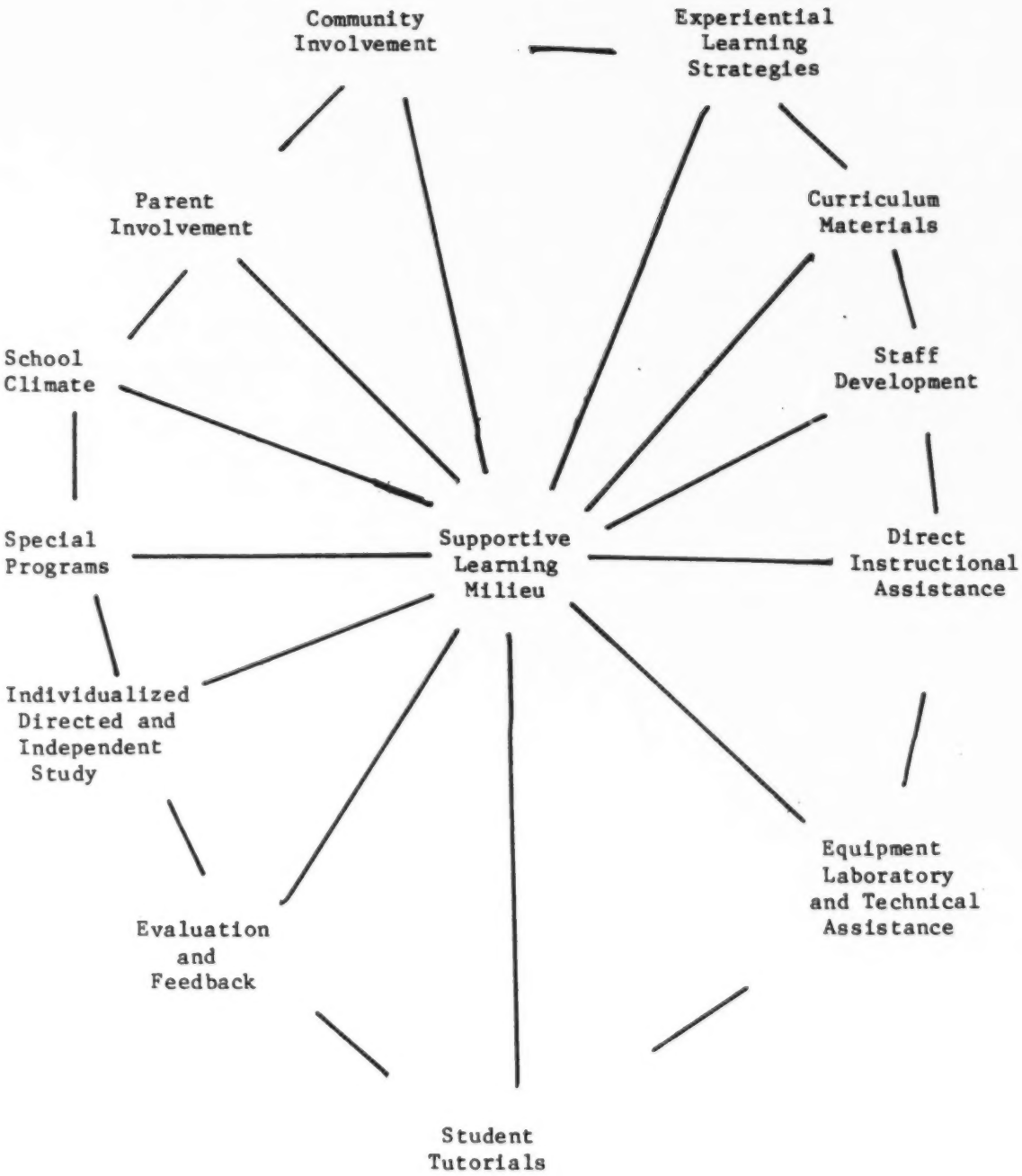
Key Components of Curriculum Development

A guiding theme for developing effective BioPrep curricula has been that conditions for learning are optimized when several variables, each established in the literature as being important to learning, are applied simultaneously so as to create an overall supportive learning environment. Several process dimensions are therefore considered in efforts to effect this theme. These multiple and interactive dimensions are portrayed in the diagram below.

While these factors can be important in practically any school setting, they appear to be critical to improving education in the rural schools targeted in BioPrep. The multi-faceted nature of educational deficiency in these schools requires both compensatory and diversified intervention, not only in the area of curricular assistance for students, but in the full range of additional areas affecting the ecology of the learning environment.

The BioPrep program must also attend periodically to factors not readily identifiable in the diagram. For example, BioPrep staff perform occasional trouble-shooting for teachers and intervention with principals or county superviors when necessary. For the most part, however, the primary ingredients for effective BioPrep curriculum development and delivery are covered by the dimensions portrayed in the diagram.

Several of the factors depicted are self explanatory while others are more complex than their labels might suggest. It may by useful, therefore, to provide a brief discussion of each.



Dimensions Involved in BioPrep Curriculum Process

Experiential Learning Strategies

Experiential education is essentially the use of authentic or concrete experiences for connecting subject matter more directly to real-life problems, issues, and activities in a manner that involves students personally in the learning.

Experiential learning strategies, then, can run the gamut from short activites in the school to extensive programs which take place separately from the traditional school setting. For example, a math teacher might begin a lesson on measurements by having students actually measure the classroom and calculate the volume of space therein. On the other hand, the school system which offers a semester internship at a local workplace is providing a more expanded experiential learning approach.

Experiential learning can be particularly suited to the needs of rural disadvantaged students. For many rural children, the importance of a quality education is, at best, only a vague a part of their realm of awareness. Frequently there is very little in their home or community background to foster this awareness. Peer group interaction, available role models, etc, are often void of any such connection. These youngsters can therefore be at significant disadvantage in the traditional classroom situation because the textbook content and nature of the school experience are largely meaningless to them, as are, in a sense, the very purposes of schooling.

However, curriculum materials and teaching strategies that are experience-based, activity oriented, and involve realistic problem solving produce improved results in learning content and process and in developing

positive student attitudes. These experiential methods more effectively demonstrate to students the relevance of subject matter to important aspects of their lives and their community. Practical problems which require for example, the collection and analysis of data, the communication of results and ideas, and the formulation and testing of solutions or improvements are an excellent way to motivate students to learn basic skills. Likewise, they are a direct means of developing the higher capabilities of problem solving and decision making and, more generally, of quantitative observation and thinking. They can also substantially enhance students' interest and enthusiasm for the pertinent subjects and related careers.

Most educators acknowledge the value of direct experiences for making learning more meaningful, for increasing student motivation, and for generally improving learning effectiveness. However, obstacles are frequently found to limit the practice of experiential education in today's schools, resulting in a situation whereby students are sometimes information-rich but experience-poor. The BioPrep program strives to manage necessary elements of the curriculum process so that these obstacles can be overcome and experiential learning can be encorporated throughout the curriculum.

Many of the experiential learning strategies applied in the BioPrep curricula follow the design prescribed in Experiential Education: A Primer for Teachers of All Subjects and Grade Levels (a guide book produced in 1982 through a federal grant in affiliation with The University of Alabama) which is used periodically as a reference by BioPrep staff and teachers. Therefore, the activities are often structured to 1) involve students in a problem-solving situation that requires individual and

cooperative effort, 2) demand both mental and physical action, and, where possible, 3) take place in "real world" settings outside the classroom. Furthermore, the activities are frequently designed to lead students to become active with important issues and to produce for the school or community tangible results (surveys, newspaper articles, service projects, etc.) that in turn reinforce students' interest and motivation.[1]

Community Involvement

As mentioned earlier, an important aspect of BioPrep is that of tying learning to student involvement in the community. This is difficult to do without getting the community involved in the curriculum. Therefore, through the preparation and conducting of the BioPrep curricula, relevant agencies and organizations in the community are identified and their participation formally engaged in appropriate activities. Participation thus far has involved the three county governments, the county medical societies, the chambers of commerce, newspapers, radio stations, television stations, the state's Department of Pensions and Security, the Alabama Heart Association, and Alabama Department of Mental Health and a host of business and environmental management agencies in each of the participating counties.

Many of these groups have participated in the program in a preceptorial fashion relating to student's projects during various parts of the program. For example, a number of student projects have required the preparation of radio or television broadcast materials as well as written materials for publication in local newspapers. Given the importance in the

BioPrep program of interaction of curricular activities with the real natural and social world, community-based assistance and opportunities for informal education play a valuable role. The potential for coalitions between business and education is an especially promising area of community involvement which the University of Alabama has recently helped to popularize through its highly acclaimed partnership with the General Motors Rochester Products Division. The BioPrep curriculum development process is very conducive to establishing such arrangements.

A major mode of community involvement for BioPrep is the constructive use of features characteristic to the rural situation. This is an undergirding principle of BioPrep that inherently distinguishes it as a potential approach for educational improvement in any rural school system. This facet of the program will be discussed further in a later section dealing with the model curriculum process.

Parent Involvement

Just as rural children sometimes do not identify with the process and purposes of schooling, so too do children from some backgrounds in the rural area not view the school as being meaningfully responsive or related to their families or to daily life in their particular outlying region (although one of the more common exceptions to this observation appears to be in the case of athletics). It seems possible that this problem may be substantially reduced through closer parent affiliation with the educational process. There is certainly adequate evidence already to show that increased parent involvement correlates with improved student performance and positive changes in teacher attitudes.

Parents were invited in the early stages of BioPrep to become involved in the planning and implementation of the project. On-going consultation and feedback with BioPrep parents concerning curricular plans continues to be a central aspect of the curriculum process. Regular letter and telephone contacts and periodic community-based meetings provide a framework for interaction with parents regarding project aims, activities, and performance criteria, and abilities and attitudes expected of students. Parents have also been treated to special visits on campus to spend time with project personnel, become more familiar with the University and the College of Community Health Sciences, and to understand the health career opportunities available to their children.

In addition, parents are frequently brought directly into the curriculum as providers of logistical or staff support for certain events and by participating in student investigations, surveys, and other sorts of learning activities.

School Climate

There are a number of factors having a bearing on curriculum effectiveness that might be categorized by the term school climate, and that appear thusly characterized with increasing frequency in the literature. Typically included under this heading are less formal influences that sometimes act subtlty to shape the overall school atmosphere and level of enthusiasm for learning prevalent among students and staff. These range from such factors as, for example, the extent to which school activities reflect involvement or interest in exciting social, scientific, or environmental issues, to the level of rapport and

cooperation among and between students, teachers, and administrative staff. "School Climate" is sometimes used interchangeably with "learning environment" and other similar expressions in reference to the culminating interplay of a number of factors, several of which have been previously discussed, that can often be linked to aspects of school organization or management.

Manifestations of school climate are seen in the extent to which a school functions as a unit toward mutually held goals, the degree of parent participation in the school, whether the school is an active or detached part of happenings in the community, and the level of effectively demonstrated care and responsiveness shown to children by school staff.

Although the etiology of a given school climate can be complex and not always subject to being easily altered, the process of BioPrep curriculum development gives regular consideration to possible ways of stimulating improvement.

Special Programs

BioPrep special programs are a chief means of providing a variety of curricular needs that usually cannot be feasibly accommodated in the normal school schedule and setting. As mentioned earlier, these are conducted on selected school days, weekends, and via full-time summer programs operating for a several-week period. Special program sessions serve as a vehicle for some sorts of experiential learning activities, a number of enrichment activities, remedial, advanced and elective courses, computer literacy training, on-campus utilization of University resources, and portions of field placements.

Individualized Directed and Independent Study

An assortment of strategies and materials have been utilized to assist student development at sufficiently progressive levels and rates. These range from directed reading, writing, and investigative assignments, to self-directed learning via such methods as performance contracts. Also, individualized tutorials provided by University students are available to project students, as are on-going academic and vocational counseling.

Beyond the need to accommodate the pace at which students are able to progress, efforts at individualizing instruction also attempt to consider individual cognitive styles, interests, and temperaments. When it is feasible to match materials and activities with these individual student characteristics, a cycle of increased motivation followed by increased learning is sustained for significant periods.

Evaluation and Feedback

Program evaluation is very important, serving on the one hand as the litmus test for efforts to structure and properly administer the curriculum process, and on the other hand as a means of providing crucial feedback to project participants.

BioPrep evaluation is both formative and summative: the former is designed to monitor student progress, provide evidence of the impact and effectiveness of the various components of the program, and determine eligibility for continued student participation. The latter focuses on the overall effectiveness of the program in achieving its objectives.

Ongoing evaluation of student progress in academic, cognitive, and communication skills is a major objective of the formative evaluation.

Evaluation methods utilize a longitudinal comparison or matched sample control group design involving an internal control group made up of students in the proceding class in each school and an external control group made up of students in a comparable school in a comparable rural school system. Baseline data on the project group and the internal and external control groups has been compiled; it consists of grade point averages, and past performance on previously administered standardized tests (or subtests if more appropriate). Baseline data also include a variety of student characteristics and attitudes, e.g., number of siblings, relatives living in urban areas, perceptions of rural living, that are used throughout the program to monitor both the career orientations and the rural orientations of the students.

Teachers fill out unit "progress reports" (developed by project staff in connection with the teachers) on each student which include quantifiable behavioral indices of student motivation (e.g., class attendance, class participation, homework preparation, volunteerism, referrals for counseling, etc.) and academic achievement (e.g., test scores, grades on papers, special projects, referrals for extra tutorials, etc.) that are used to monitor student progress, assist in the determination of the eligibility of students to continue in the program, provide information for the ongoing evaluation of overall program effectiveness and impact, and provide data for the analysis of variables predictive of successful attainment of program goals. These reports, along with counseling and tutorial reports, also provide data useful for the comparison of the effectiveness of the program in the participating counties, each of which have certain unique characteristics (e.g., class meeting time, teacher characteristics, etc.).

In order to minimize or eliminate the development of academic, interpersonal or emotional problems which may contribute to inadequate or deficient performance in the program or even constitute drop-out conditions, student performance is monitored and assistance provided by teachers, tutors, and counselors through means established as part of the project, i.e., inservice training of teachers, tutors, and counselors by project staff and experts from The University of Alabama faculty. Regularly scheduled meetings of these groups and checklists or observation forms to be filled out are used in monitoring potential problems. As an integral part of the evaluation plan, records are maintained on each student, indicating the number of program hours completed, grade point average, progress reports, tutorial and counseling reports, etc. These criteria form the basis for an evaluation of eligibility to remain in the project the following year.

Evaluation is also conducted for the impact of the program's activities on families and communities in the participating counties. The relative effectiveness of student projects, such as health fairs and interviews with county residents with chronic diseases, form the bases for making such determinations, as do longitudinal evaluations of attitudes and perceptions toward the program of county school district personnel, parents, community leaders and citizens. These evaluations are conducted by means of survey, either surveys of program activity participants, such as those participating in health fairs conducted by students, or by random samplings of attitudes and perceptions of health and health care of county citizens.

The summative evaluation to be conducted during the fifth year of the project will center on the effects of program participation on target student successful enrollment in post-secondray school studies and in expressed interest in pursuing careers in the biomedical sciences. The two control groups will provide comparative data. In addition, each group will be administered a vocational interest pre- and post-test to determine the effect of the program's objective of encouraging students to pursue biomedical careers. The students who drop out of the program will also be studied to determine whether partial program participation had any impact on both-secondary studies and potential career choices.

Student Tutorials

The main reason student tutorials are singled out from other forms of individualized assistance is that the benefits of students tutoring fellow students are found to be notably greater in some ways than those from many other means of instructional aid. In addition to greater academic growth for both parties, tutor and tutored are positively reinforced in the development of certain personal and social qualities and acquire an increased sense of participating productively in the valued aims of education.

Equipment, Laboratory, and Technical Assistance

Many of the instructional materials and activities provided in the BioPrep curricula require that the frequently ill-equipped laboratory conditions and ill-prepared teachers in rural schools be attended to in short order. Equipment and technical assistance needs are assessed by BioPrep staff and/or consultants, then are provided for either through loan, solicited contributions, or purchase with available BioPrep funds.

Direct Instructional Assistance

Another undergirding aspect of BioPrep is the fact that it constitutes a mechanism for close and cooperative partnership between public schools and several key institutions. Linkages have been established between the three target school districts and the University of Alabama, College of Community Health Sciences, various Departments of Science and Humanities, the National Health Service Corps sites in the West Alabama region; and a number of other support agencies. These linkages provide the basis for the major training sites for the project and major sources and contributions of instructional personnel. Direct instructional assistance to BioPrep target schools is supplied readily in the school and during courses, labs, and activities held at the University and other sites.

Instructional personnel include program staff, selected professionals from community agencies, and University faculty with special expertise. The program has utilized scientists, physicians, nurses, artists, and a host of technicians from various fields.

Staff Development

A foremost context in which student learning is examined is that of the interdependent transactions between learning behaviors, the manner and quality of teaching, and elements of school administration which influence the teaching-learning process. Thus, under the component of staff development attention is given to teacher performance in conjunction with various organizational aspects of school administration.

Frequently teachers in rural schools have only a minimal knowledge of subject content. The generally weak support often given to teachers interested in earning advanced coursework serves to prohibit improvement in this area. A similar situation exists with regard to teaching style.

In many schools, teaching strategies relied upon by most teachers are predominantly in the form of lecture and lecture-discussion. Almost all of these teachers need to learn additional methods, including experiential and problem-solving teaching techniques. They also need updating in the use and effectiveness of available materials and other types of learning aids such as computers, laboratory exercises, and out-of-class resources.

In addition, the training of teachers and administrators has too often left them lacking in understanding of child development needs and issues, which can be of serious degree in disadvantaged rural areas. Thus, implementation of the BioPrep curricula requires a rather comprehensive approach to staff development. And this is supplied on a regular and continuous basis.

Teachers are provided in-service training on a schedule resembling the frequency of special sessions conducted for students. That is, they participate in weekday, weekend, and summer programs structured to meet areas of need described above and tied to specific skills required to effectively teach the activities and materials of the BioPrep curricula.

Since the BioPrep curricula often require special administrative arrangements and support, such as laboratory exercises, scheduling for community-based activities, and alloting extra teacher preparation time, school administrative personnel are also given staff development assistance where appropriate. Project teachers, counselers, and supervisory staff are

all provided periodic follow-up support and consultation throughout the program. Also, opportunities are made available, where possible, for project personnel to take advantage of professional improvement programs being offered across the state and country.

Staff development is planned to formally coincide with the progressive stages of the project and is conducted by BioPrep staff, selected University faculty, and recognized experts from other acclaimed programs.

Curriculum Materials

The term "curriculum development", in the broad sense, includes the structuring and provision of the many elements that contribute to the overall learning situation. In a narrower sense, the term refers primarily to the selection or organization of the actual content and sequence of subject matter and associated learning activities.

Curriculum materials used in BioPrep are products of curriculum development in the narrower sense, generated through a process of matching the overall conditions and learning needs identified for curriculum development as defined in the broader sense. These include texts, formats, guides, and complimentary and supplementary enrichment materials, either acquired or specially developed, to facilitate the various program concerns discussed in this report.

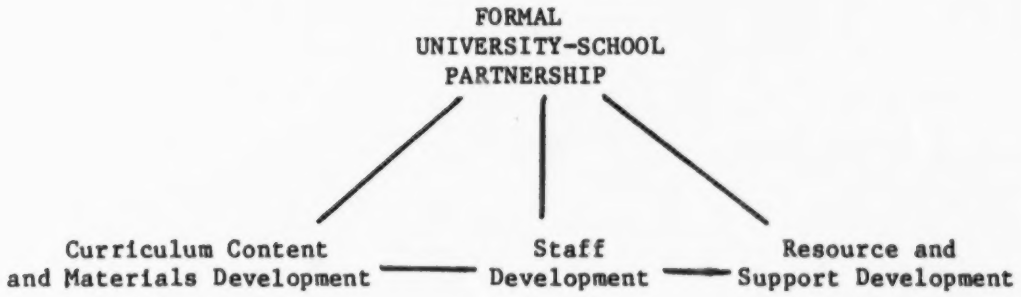
A Model Curriculum Development Process For Rural Schools

The recognition of the full nature of problems obstructing improved education in rural Alabama schools has, in some ways, been a trial and error process. Likewise, coordination of BioPrep strategies to address these numerous obstacles has occurred through the experimental blending of different approaches that have been used successfully across the nation to treat one or another area of educational need. In fact, perhaps a most distinguishing feature of the program is that the needs of the target schools have prompted the assimilation of many recognized means of educational improvement and support into the process for BioPrep curriculum development.

The Process

The process itself essentially involves management of the previously discussed curricular components/influences as they relate to a given rural school, for the purpose of achieving the integrated development of students, keeping in mind the broader educational needs of society. A main catalyst of the process is the uncommon framework, which is at once both basic and profound, from which it extends: the formal cooperative partnership between the University and the target schools.

This partnership constitutes the core aspect of BioPrep and greatly facilitates the three practical functions of the curriculum development process: 1) needs assessment, 2) program design and development, and 3) program implementation and refinement. Key areas of activitiy that overlap with these functions, and that comprise the main modes of delivery stemming from the partnership, can be portrayed schematically as follows.



The reciprocal relationship between the University and each school system serves to provide a kind of laboratory for educational improvement whereby problem areas can be studied and possible solutions tested. Also, the sustained nature of the relationship allows an organized systematic treatment of needs conducted over the long term, thus supplanting traditionally short term and piecemeal assistance usually provided by College of Education faculty on a sporadic basis.

There are five dominant problem areas associated with education in disadvantaged rural schools and that are dealt with in the BioPrep curriculum development process. They are:

1. The quality of the learning behaviors of students;
2. The quality of the instructional behaviors of teachers;
3. The quality of the school and home supports for academic learning;
4. The adequacy and rational use of the educational resources (including time) and their availability to students and teachers;
5. The purposeful and systematic organization and management of these several factors.

The BioPrep program addresses these problem areas with a perspective on the rural setting that, as stated earlier, is an underlying aspect of

the program. BioPrep views the rural situation not as a deficit to be overcome but as a feature to be utilized and built upon. For example, as discussed earlier, student investigations of their communities and abundant natural surroundings were used to explore community needs while also instilling appreciation for the values of rural living.

Efforts to improve the quality of education in rural areas should not only recognize and seek to maintain these values, but should also capitalize on the yet untapped potential of rural features for conducting effective learning. Cecelia Traugh, of the University of North Dakota Center for Teaching and Learning, cites several readily available possibilities for doing so[2]. Below are just three examples demonstrating applications for each of the main subject areas dealt with in BioPrep.

English - Some of the literature studied by students could be that which reflects rural life, values, and isolation.

Social Studies - The curriculum could include elements which connect students to the local culture. The second language of the area could be available for study. Local histories could be investigated.

Science - Science classes could capitalize more fully on the vast laboratory and observation base surrounding the school and on the scientific concerns of the farming community.

A Model Curriculum

The BioPrep 9th grade curriculum is an example of how the curriculum development process can build on the rural setting and also encorporate the other identified components of educational improvement. Once initially identifiable curriculum needs were determined for the ninth grade, appropriate texts and materials were selected and developed in

conjunction with the preparation of school staff and the development of resources and support.

As students emerge from adolescence, they become more concerned with what life means, what the world is like, and with their role in the scheme of things. Hence, the selected focus for the ninth grade was the interaction of science with the community in relation to genuine questions about life. A suitable high quality science text was selected and additional materials developed to carry out this focus in accordance with the other program aims and concerns.

The selected science text was Biological Sciences: A Molecular Approach (BSCS, 1980)[3]. Additional materials were organized and developed in the form of a special learning activity guide to be used by teachers in conducting the ninth grade coursework. The structure and implementation of this guide constitute a curriculum model reflecting the process and components of curriculum development discussed in this report.

Entitled Exploring The Mystery of Life: A Teacher's Learning Activity Guide for the Study of Biological Sciences, the Guide was prepared for primary use in the ninth grade biology course. However, it was also designed to allow corresponding application in other subjects, by teachers individually or in coordination with the biology teacher. Through the synchronization of content and learning activities for each of the areas of science, English, and social studies, the Guide served as a main means of delivery for the ninth grade BioPrep curriculum. Being experiential and interdisciplinary throughout, it provided a unifying way to organize the several BioPrep subjects and aims into one modality.

An effective way to conceptualize the Guide is as an overlay to the text, revealing an enhanced interdisciplinary pathway through the academic content. This path is marked by special places along the route where students are led to see various subject matter as being interrelated and are able to experience course content in meaningful connection to themselves and their surroundings. These special places are referred to in the Guide as Key Activities, Alternative and/or Follow-up Activities, and Supplementary Activities. They are organized within larger teaching units, with each unit containing several Key Activities that, in turn, are each linked with a number of the Alternative/Follow-up and Supplementary Activities.

The Key Activities are the mainspring of each unit. They represent the prescribed strategies for achieving an effective interface of curriculum process components discussed in this report. However, for situations which prohibit conducting a given Key Activity, the Guide includes several options. These are labeled "Alternative and/or Follow-up" because they are designed to be suitable either as substitutes or as additional pursuits to the associated Key Activity.

Each unit of the Guide begins with an "Overveiw" which describes the basic focus of the unit and its relationship to the text, and a "Rationale" to 1) explain the reasoning and purpose for the unit and 2) assist the teaacher in drawing thought-provoking connections between the subject matter and genuine issues or questions that may attract student interest. Next, the "Unit Objectives" are listed, which express general skills and understandings to be gained from the unit activities, and which represent an active application of academic content covered in the corresponding portion of the text.

The Key Activities of the unit are presented after Unit Objectives in successive order, each followed by a "Suggestions" section offering tips, precautions, and other information that may be helpful to the teacher in conducting the Key Activity smoothly and effectively. Supplementary Activities are grouped together in a separate section of the Guide for easy reference, with those Supplementary Activities appropriate to each Key Activity are so indicated.

Finally, each unit concludes with the description of the "Unit Product". Since a cornerstone of the Guide is its use of experiential learning strategies, many of the activities involve students in producing tangible results. The Key Activities especially are planned to generate results that can contribute to, or be assimilated into, a purposefully organized tangible product such as those described earlier.

There are seven units in the Guide. They were developed by clustering chapters of the text in relation to several major questions concerning actual scientific investigations of life. The units were put in order accordingly and the questions were assigned as titles in logical sequence as follows:

Unit I	How Can We Know About Life?
Unit II	What Do We Know About the Beginning of Life on Earth?
Unit III	How Does Life Generate New Life?
Unit IV	Why Are There So Many Different Forms of Life?
Unit V	What Basic Processes Support Life?
Unit VI	How Are the Basic Life Processes Maintained?
Unit VII	What Are the Roles and Functions of Different Life Forms?

Activities in the units were intended for application at designated points in conjunction with anticipated progress in the text. Additional activities, special programs, student assistance, staff development, and other program elements were coordinated with this plan.

The beginning sections and Unit V of the Guide (together with Supplementary Activities related to Unit V) are attached to this report as an Appendix. Unit V, entitled What Basic Processes Support Life?, corresponds to textbook chapters 17 thru 23, which cover the human body's several energy processing and regulatory systems. A brief discussion of this unit will help to further explain development of the Guide as a curriculum model.

The Introduction and Chapter I of the Guide provide a short restatement of many of the elements of the BioPrep curriculum process as they apply to the Guide's design and implementation, and as they are subsequently reflected in Unit V. The Overview and Rationale of the unit set the stage to help teachers draw meaningful connections between the forthcoming unit activities and important themes of BioPrep.

There are four Key Activities in Unit V. The first is an on-site investigation of the environmental health of a disturbed land area. The second and third Key Activities shift students' attention to examining the health of their own bodies through investigations of their physical and nutritional fitness. The final Key Activity involves a broader investigation of conditions in the community designed to demonstrate connections between environmental health and human health.

Procedures for conducting these activities are described in the Appended materials. Each activity is designed to accommodate the elements of the BioPrep curriculum process. That is, each is interdisciplinary and experiential, provides opportunities for parent involvement, community involvement, direct instructional assistance, and related individualized study. Also, the activities frequently utilize additional learning

materials, equipment aids, and technical assistance, and are coordinated with appropriate teacher and supervisory staff development. In addition, the nature of the activities is such that successful implementation is likely to positively influence aspects of school climate.

For example, the first Key Activity of the unit (Key Activity 8 - "Investigating Life Processes in the Natural Environment") is an experience-based, problem-solving investigation that involves observing, measuring, and analyzing environmental factors, such as soil and vegetation conditions, drawing relationships between the health of these factors and the activities of human society, and presenting findings in various communication modes. The activity was conducted with direct instructional and equipment assistance from the Alabama Forestry Commission, The U.S. Soil Conservation Service, and a local engineering firm. Lessons learned from the activity were incorporated later in the Unit Product to demonstrate environmental health conditions in the local community.

Remaining Key Activities of the unit can be examined to reveal similar design consistent with the BioPrep curricular aims and process. This is the case also for the other units contained in the Guide but not included in this report.

As an interesting note, several months following development of the Guide, and totally unexpected by BioPrep staff, the National Science Board Commission on Precollege Education reported recommendations corroborating the importance of many of the aspects involved in the BioPrep curriculum approach.[4] Though some of these recommendations were made for middle school science, they are certainly applicable to the needs of ninth grade students in the target schools. NSB recommendations pertinent to the BioPrep ninth grade curriculum are listed below.

1. Concrete experiences should be used to build on and further develop the basic skills of science introduced in the elementary grades.
2. Though the emphasis of the program should focus on concrete experiences, problem solving and logical reasoning experiences should be interwoven so that students can ask questions, manipulate variables, make generalizations and develop concepts.
3. The program should be exploratory in nature; an integrated or unified approach which covers earth, physical, life and health sciences during the year.
4. The program should interact with other disciplines. (Acid rain or nuclear power--science and social studies; data collecting or graphing--science and math.)
5. The program should reflect decision making, so that students can evaluate personal and societal implications in regard to science and technology.
6. Use of local resources should be encouraged in order to extend the learning experience beyond the school walls and hours.
7. There should be emphasis in grades 9-11 on the application of science and technology to the improvement of the community, local and national.
8. Curricula should be organized around problem-solving skills, real-life issues, and personal and community decision making.
9. Provision should be made for interaction with the community and with informal education centers.

Applying the ninth grade curriculum to address such concerns as are contained in the above recommendations was not always easily achieved. In fact, the developed Guide is itself still being revised to better meet some of the difficulties encountered in its implementation.

The nature of many of these difficulties are discussed in other reports being presented by this panel. A major problem initially was that of stimulating willing support on the part of school staff for conducting the sequence and activities of the curriculum. Their background and prior educational training was frequently at odds with strategies employed in the curriculum and, subsequently, important aspects of the curriculum were sometimes dealth with poorly or ignored altogether.

Another important problem hindering implementation of the BioPrep curriculum approach continues to be the organizational and operational constraints typical of many schools. These include excessive and conflicting school- sponsored events unrelated to academic development, prohibitive scheduling and logistical factors, and a number of burdensome tasks required of teachers that constrict teaching performance.

In summary, the BioPrep curriculum development process combines a wide range of quantitative and qualitative educational concerns in a manner aptly suited to the rural situation. As indicated by the ninth grade curriculum, the BioPrep approach can serve as an effective model for educational improvement in rural schools. While the process is still evolving to better address existing problems, it appears to function well in this adaptive respect.

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3. Biological Science: A Molecular Approach. BSCS Blue Version, Fourth Edition. Lexington, Mass., Toronto: D.C. Heath and Company, 1980.

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APPENDIX

EXPLORING THE MYSTERY OF LIFE

A Teacher's Learning Activity Guide
For the Study of Biological Sciences

Produced in conjunction with the Biomedical Sciences
Preparation Program for Rural High School Student, College
of Community Health Sciences, University of Alabama,
Tuscaloosa, 1983

EXPLORING THE MYSTERY OF LIFE

Activity Guide

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Introduction

This Learning Activity Guide was originally prepared to assist in the teaching of ninth-grade biology using as the primary student text, Biological Science: A Molecular Approach (BSCS, 1980). However, the organization of the Guide, and the array of learning activities included are generally applicable for many other commonly used biology texts.

The purpose of this Guide is to provide the teacher with an applied problem-solving approach for stimulating learning. Many of the activities involve students in first-hand investigations of aspects of the local community, the natural environment, the school, or even of the students themselves. Developed with a prevailing focus on genuine issues and questions about life, the Guide also provides multiple opportunities for interdisciplinary study.

The underlying premise for the Guide is that students are more motivated to learn, and that learning is more meaningful, when academic content is complemented by experienced-based learning activities. Therefore, most activities presented in the Guide incorporate experiential strategies, ranging from short and simple classroom applications to more involved out-of-class pursuits.

Another main concern is with the personal and social development of students. Much of the orientation of this Guide is toward a blending of personal and social growth with academic growth. Through cooperative exploration of authentic issues and aspects of the real world, students are led to acquire a more mature perspective for self, others, and life in general.

Throughout the Guide is a theme of active concern for health, not only for human health but also for the health of our natural environment and the fellow creatures with whom we share the mystery of life. Thus, in addition to investigations of human physiology, there is also an emphasis on examining the interdependence of man and nature.

Overall, the Guide seeks to nurture a fundamental aspect of sound intellectual development--the capacity for wonder and thoughtful analysis in the quest to understand our universe. An integral assumption is that scientific thinking and critical thinking must go hand-in-hand if we are to successfully address the complex mix of practical, philosophical, and moral issues before us today. Though perhaps an extreme challenge to the conceptual abilities of some youngsters in their developing years, activities in the Guide occasionally prompt the teacher to proceed well beyond a purely informational level. As biologist Rene Dubos

suggests, there are additional important considerations to instill in the minds of young science students: "Scientists should not be satisfied with studying the biological machine whose body and mind can be altered and controlled by drugs and mechanical gadgets. They should become more vitally concerned about the nature and purpose of man" (1968, p.9).

It is hoped that this Learning Activity Guide will prove feasible for most teaching situations. The next chapter offers some hints toward that end.

CHAPTER I

How To Use The Guide

The curiosity of early scientists prompted several major questions concerning the investigation of life. Anyone sufficiently curious about life, be they scientist or non-scientist, would likely pose the same questions. This Guide has arranged seven of these questions in a logical sequence and provided learning activities relevant to each.

These seven questions serve, respectively, as titles for curriculum units included in the Guide:

Unit I	How Can We Know About Life?
Unit II	What Do We Know About the Beginning of Life on Earth?
Unit III	How Does Life Generate New Life?
Unit IV	Why Are There So Many Different Forms of Life?
Unit V	What Basic Processes Support Life?
Unit VI	How Are the Basic Life Processes Maintained?
Unit VII	What Are the Roles and Functions of Different Life Forms?

As stated earlier, the Guide is structured to accommodate the chapter progression of the student text, Biological Science: A Molecular Approach. Still, learning activities included in the seven units are easily adapted to different teaching needs. Learning possibilities are likely to be enhanced in most classes by simply inspiring in students a heightened sense of wonder over the various title questions.

A first recommendation for using the Guide is to become generally familiar with its organization and contents. You will notice that Chapter II contains the seven units and that each unit is composed of one or more KEY ACTIVITIES. Following each KEY ACTIVITY are a number of "Suggestions" to facilitate successful completion of the activity.

An "Overview" and "Rationale" are provided at the beginning of each unit to 1) explain the thought behind the KEY ACTIVITIES in the unit, and 2) help the teacher in drawing thought-provoking connections between subject matter and genuine questions about life.

The KEY ACTIVITIES are the prescribed strategies for conducting each unit. They are, for the most part, learning activities which have proven their effectiveness in achieving the aims of this Guide and the stated objectives that are also included for each unit. However, for situations which prohibit conducting a given KEY ACTIVITY, several options are also listed. These options are labeled

"Alternative and/or Follow-Up Activities" because they frequently are suitable either as a substitute or as an additional pursuit in conjunction with the KEY ACTIVITY.

A final element included for each unit is the "Unit Product." An important reinforcement for learning occurs when students' problem-solving efforts result in a concrete product that can be viewed, handled, or actually applied toward a meaningful end. This final element describes such a product suitable for the KEY ACTIVITIES of each unit.

The KEY ACTIVITIES are usually interdisciplinary in scope. But, to encourage coordinated participation by other disciplines, Chapter III contains a series of "Supplementary Activities," most of them in the areas of English and Social Studies. Consulting this chapter, teachers can correlate coverage of the two areas of science and humanities. In effect, Chapter III provides suggested ways for using the unit activities as springboards or catalysts for teaching English and Social Studies content.

Chapter IV, of course, contains a listing of resources. Some are previously referenced elsewhere in the unit activities. Others are included because of their general potential for assisting teachers in implementing activities of the Guide.

A second recommendation for using the Guide is to make the opportunity to rejuvenate your own sense of wonder for the mysteries of life. This may be tough to do in the face of daily pressures of work and survival. Yet, an active and vibrant curiosity can be very contagious around students. Also, interesting educational and scientific magazines can provide a steady dose of stimulating ideas for use in class, as can regular exposure to such educational programs as "Nova," "Cosmos," and "National Geographic Specials."

A final recommendation is to take a thoughtful look at the required content for your current curriculum. Determine when and where the units of the Guide might best complement this required curriculum. Then, in consultation with the principal and interested teachers, plan for the necessary materials, logistics, and assistance necessary to conduct those parts of the Guide you choose to use.

Schools which are already accustomed to experiential learning strategies will likely have little difficulty utilizing this Guide. A recommendation for those who are not similarly acquainted is to arrange for in-service assistance from the College of Community Health Sciences at the University of Alabama. Meanwhile a useful reference is Experiential Education: A Primer for Teachers of All Subjects and Grade Levels, (Phillips and Crew, 1982), available through the Department of Secondary Education, Box R, University of Alabama, University, AL 35486.

CHAPTER II

Key Activities

Unit I How Can We Know About Life? (BSCS 1, 2)

KA1: The Process of Classification

SA1: English--Classification Essay
SA2: English--A Category of Persons
SA3: English--Observation Exercise
SA4: English--Another Observation Exercise
SA5: Social Studies--Classification Activity
SA6: Social Studies--Another Classification Activity
SA7: Social Studies--Inductive and Deductive Reasoning
SA8: Social Studies--Observation Exercise

Unit II What Do We Know About the Beginnings of Life on Earth? (BSCS 3, 4, 5, 6, 7)

KA2: Critical Analysis
KA3: Map-and-Compass Journey

SA9: English--Book Report
SA10: English--Evolution of Language
SA11: English--Developing Student Interest in Writing
SA12: Social Studies--Sociocultural Evolution
SA13: Social Studies--Social Adaptation
SA14: Social Studies--Social Adaptation, Revisited
SA15: Social Studies--Evolution

Unit III How Does Life Generate New Life? (BSCS 8, 9, 10, 11, 12)

KA4: Molecular Scavenger Hunt

SA16: English--Grammar, Sentence Expansion, and Sentence Combining
SA22: Social Studies--Secret Agent
SA23: Social Studies--Making A Quipu

KA5: Population Growth

SA17: English--Ethics Essay on Population
SA18: Social Studies--Malthus
SA19: Social Studies--Population
SA20: Social Studies--Overcrowding
SA21: Social Studies--Development

Unit IV Why Are There So Many Different Forms of Life? (BSCS 13, 14, 15, 16)

KA6: Survey of Hereditary Traits

SA24: English--Genetics Essay
SA25: Social Studies--Resource Speaker on Community History
SA26: Social Studies--Human Similarities and Differences
SA27: English and Social Studies--Active Reflection on Physical and Cultural Inheritance

KA7: Microenvironments

Unit V What Basic Processes Support Life? (BSCS 17, 18, 19, 20)

KA8: Investigating Life Processes in the Natural Environment

SA28: English--Nature Poetry
SA29: English--Environmental Vocabulary
SA30: English--Environmental Essay
SA31: English--Another Environmental Essay
SA32: English--Environmental Play
SA33: Social Studies--Vegetation Zone Maps
SA34: Social Studies--Early Alabama
SA35: English and Social Studies--Controversial Environmental Issue
SA36: Math--Soil Erosion
SA37: Math--More Soil Erosion

KA9: A Class Fitness Profile

SA38: English--Dictionary of Dialect and Slang
SA39: English--Writing as a Process
SA40: Social Studies--Fitness Debate
SA41: Social Studies--Carbon Dioxide Emissions and Health
SA42: Social Studies--Alabama Waterways
SA43: Social Studies--Landmark Trees
SA44: English and Social Studies--Effects of Air Pollution
SA45: Math--Mean, Median, and Mode
SA46: Math--Graphs

KA10: Monitoring Personal Nutrition

SA47: English--Foods Essay
SA48: English--Nutritional Interviewing
SA49: English--Dumping Trial
SA50: Social Studies--Transport Systems
SA51: Social Studies--Ethnic Meal
SA52: Social Studies--Meat
SA53: English and Social Studies--Global Malnutrition Essay
SA54: Math--Quantity of Food
SA55: Math--Weight of Food Waste

KA11: A Community Environmental Quality Index

SA56: English--Yet Another Environmental Essay
SA57: English--Environmental Change
SA58: English--Environmental Quality Articles
SA59: Social Studies--Litter Analysis
SA60: Social Studies--Poisoning
SA61: Social Studies--Hunting as a Management Tool
SA62: English and Social Studies--Industrial Location Debate
SA63: Math--Population Growth Computation

Unit VI How Are Life Processes Maintained? (BSCS 22, 23, 24)

KA12: Sensory Perception

SA64: English--Journal of Perceptions
SA65: English--Differing Perceptions
SA66: English--Contrary Perceptions
SA67: Social Studies--Group Perceptions
SA68: Social Studies--Professional Language
SA69: Social Studies--Body Language

KA13: Flexibility and Endurance

SA70: English--Writing Muscles
SA71: English--Precise Writing
SA72: English--Muscular Prose
SA73: English--Active to Passive
SA74: English--Correcting Inflated Prose
SA75: English--Varying Language
SA76: Social Studies--Adapting to Change
SA77: Social Studies--Society as Organism
SA78: Social Studies--Social Roles

Unit VII What Are the Roles and Functions of Different Life Forms? (BSCS 24, 25, 26)

KA14: Biorhythm Analysis

SA79: English--Ethics Essay
SA80: Social Studies--Personal Orbit

KA15: Interrelationships and Specialization

SA81: English--Comparison Essay
SA82: English--Opposing Viewpoints
SA83: Social Studies--Community Exploration
SA84: English and Social Studies--Values

UNIT V

WHAT BASIC PROCESSES SUPPORT LIFE?

Overview

This unit addresses the question, "What are the basic life processes?" Designed to complement chapters 17 through 20 in the Biology text, the unit begins with a comparative investigation. First, students visit an outdoor site where the land surface has been severely disturbed. They gather information about the life processes which support a healthy environment and examine ways in which these processes, in their damaged condition, are not functioning properly. Next, students do an investigation of several of their own life processes and assess their individual fitness with respect to these functions. Remaining activities are organized so that students can complete the unit by producing an initial report on the health condition of the class and of the local natural environment.

Rationale

The previous unit dealt with the question, "Why are there so many different life forms?" Students explored genetics, selective breeding, mutation, etc., as determinants of variation in life forms. But this look at differences between species and at variety within species also serves to draw our attention to one overwhelming fact--despite the differences among living creatures, all have in common the profound phenomenon called life.

In view of this common bond, an early question of science was, "What common processes support the function of life in most creatures?" Answers to this question include the systems presented in the chapters of this unit--the transport, respiratory, digestive, and excretory systems. These systems, whether in simple or complex forms, appear to provide the necessary support processes for life in most organisms.

Now comes an interesting perspective. While each creature has its own set of support systems, in a broader sense the natural environment operates by means of comparable support systems, which, taken together, are referred to as "ecosystems." For example, soil functions in both a digestive and waste-disposal capacity and therefore plays a major role in the ecological health of a given area. Similarly, photosynthesis performs a critical respiratory function for the entire global system. Likewise, the water cycle constitutes a major transport system for life in general.

A frequent tendency is to think of support systems such as respiration and digestion as pertaining only to the human body. In fact, these basic processes are necessary in most life forms, from the smallest one-celled creature to the largest ecosystems. Helping students remain aware of this fact will likely add to their sense of wonder for the subject of science.

The first KEY ACTIVITY, (8), is an environmental investigation of a disturbed land area. In studying the human body's life-support systems, it is helpful to understand the body's connection to the basic life-support for all life--this, of course, is the land itself, with its vital functions and wondrous web of living creatures.

Quite likely, KEY ACTIVITY 8 will be full of surprises. Students should discover that the land about them, which they have probably always taken for granted, is composed of complex life functions. Also, they should discover that these functions are more susceptible to damage than they may have suspected, and that the land is, in fact, in poor health in many places.

Next KEY ACTIVITY 9 returns the students' focus to the health of their own bodies. Quite likely they will discover several surprises here, too. Since youth is often associated with boundless energy and activity, the idea of not being physically fit may not seem realistic to many students. When actual physical tests are conducted, however, a different picture may emerge.

Likewise, KEY ACTIVITY 10 deals with another area of personal health--nutrition--and is also intended to provide students with a clearer picture of their own health. One of the most important, yet one of the most neglected and abused areas of personal health and fitness, is nutrition. It is a subject of ongoing research, and scientists are continually revising dietary recommendations in the light of new studies. Nonetheless, the aphorism, "You are what you eat," contains more than a little truth. When combined with a program of proper exercise and good health habits, sound nutritional practices can lead to a healthier, more productive existence.

Finally, KEY ACTIVITY 11 returns focus to the interrelationship of human health and environmental health. It is intended to reinforce the important lesson that human life is part of a broader community of life on earth, and that human health is related to the overall health of this community.

The unit will give you a chance to raise in students' minds a host of related questions: How is the local natural environment being damaged or threatened? How well are my

own life-support processes functioning? How does environmental degradation effect human health? How can people provide for human needs and still protect the natural environment? What can I do to improve my personal health and fitness?

This unit leads students to examine the parallel between human life processes and life process in the natural environment. The activities offer students an opportunity to investigate these processes where they actually exist--within the functions of their own bodies and in the local environment.

Objectives

Upon conclusion of Unit V, the students should:

1. be able to describe at least three local environmental problems which have implications for human health;

2. know the general fitness level of their own respiratory and circulatory systems;

3. be able to compare the quality of their own average weekly diet with that of an optimal nutritious diet;

4. demonstrate concern for environmental health by completing a local site reclamation project;

5. demonstrate concern for community welfare by completing a class report which presents an overview of connections between local environmental health and human health.

KEY ACTIVITY 8: Investigating Life Processes in the Natural Environment

This activity involves a comparative study of a healthy site and a site at which the soil has been severely disturbed. Explain to the students that they will be doing an environmental investigation to learn more about conditions at the chosen location.

If a study site can be found on or near the school grounds, it will facilitate future monitoring of site changes.

The local U.S. Soil Conservation officer can provide invaluable assistance in practically every aspect of this activity, and if contacted early enough he will likely be eager to locate a suitable site and help conduct the activity.

Begin the activity by having each student formulate in writing his own description of soil. Then proceed through the steps described below:

1. Have small groups of five to eight students stake out an area two to three feet square in the disturbed site. Then ask them to sift through the top three inches of soil and record both a name/description and some estimate of quantity for all evidence of plant and/or animal life they observe.

2. Have each small group stake out an area two to three feet square in the undisturbed site and repeat the observation and recording process.

3. After sharing/discussing findings from steps #1 and #2, provide each group with the necessary instruments, calculating procedures, etc. (all of which can be obtained from the U.S. Soil Conservation Service). Then, put the students to work determining answers to the following questions:

   a. Approximately how large is the watershed associated with each site?

   b. What is the average slope for each site?

   c. What would be the calculated soil erosion for each site if the vegetative cover were absent?

   d. What is the soil pH at each site?

4. Have each group compare findings from the two sites and list:

   a. at least four environmental problems observed at the disturbed site;

   b. any threats to the surrounding environment that might result from these problems.

5. Conduct a class discussion in which each small group can present its investigational findings. Have the class determine which important environmental functions are disrupted at the disturbed site and whether any of these functions have implications for human health. Finally, have them develop a list of suggestions for better land-use practices.

Suggestions

--This activity is best suited for an area where healthy land exists adjacent to land that has been disturbed and in eroding (such as an unreclaimed strip-mine site or eroded farmland). However, the activity can be easily altered to fit different situations. The main concern is to provide students a comparison between at least one site where the soil and vegetation are healthy and at least one site that is environmentally damaged.

--Should you desire to expand this activity (for instance, to include a broader investigation of soil chemistry, resident wildlife, etc.), you may want to ask your Soil Conservation officer to help recruit assistance from additional sources.

ALTERNATIVE AND/OR FOLLOW-UP ACTIVITIES

1. Have students individually write a) their own description of soil; and b) a list of soil-related environmental problems of which they are already aware. Next, view the film, "The Temperate Deciduous Forest" (see Appendix). Finally, have students work in small groups to identify local sites where soil-related environmental problems exist.

2. After conducting KEY ACTIVITY 8, have students locate a disturbed site on or near the school grounds which can be repaired by means of re-vegetation. Let students arrange assistance for this repair project with the Soil Conservation Service (which, at the right time of year, will donate the saplings). Organize the reclamation project so that students can utilize science/math procedures to monitor change at the site.

3. Let students contract individually to spend a designated amount of time doing volunteer work at the Soil Conservation Office. (See Appendix: "Designing Student Contracts.")

KEY ACTIVITY 9: A Class Fitness Profile

A profile of the class fitness level is the focus of KEY ACTIVITY 9. The class will look at individual scores on three measures of fitness and compile a chart showing the overall level of the class. These three measures could be used in a school Fitness Fair (see Unit IV: "Unit Product").

Begin this activity by dividing students into three groups. These groups will rotate through each of the three fitness measures. By rotating the groups, it is possible to finish these assessments in one class period. However, you may want to take more time than this. The tests are relatively easy to administer and are described in general fashion below.

The three fitness measures the students will be assessing are:

1. Blood Pressure
2. Pulse Recovery
3. Breath Recovery

Blood Pressure

1. Have the students practice taking blood pressure. This activity will probably require some initial expert assistance. You may want to consult with the school nurse or invíte some other medically trained person to help get this session started. Also, you may need to consult a health-care professional for help in acquiring the necessary equipment.

2. Have students measure one another's blood pressure. If difficulties arise in this procedure, you may choose to let the health-care assistant repeat the measure to ensure accuracy.

3. Record the individual results.

Pulse Recovery

1. Take a 15-second resting pulse by placing two or three fingers (not the thumb) beside the esophagus, pressing, and turning the head until the pulse of the carotid artery is felt. Count the beats for 15 seconds, then multiply by 4. Each student records this number.

2. Run (not jog) in place for three minutes; or, use a 12-inch-high stool and step up and down for three minutes. If this step-test is used, a metronome set at 96 is needed to ensure a rate of 24 steps per minute. (A metronome can be secured from the school music teacher.) Record the pulse rate immediately after the three-minute run or step-test.

3. Wait five minutes. Record the pulse rate again. Compare the rate before the exercise to the rate five minutes after the exercise. Ideally, these rates should be almost equal.

Breath Recovery

1. Have the students measure their own resting breath rate by counting the number of exhalations in one minute. Record this number.

2. Have the students perform some relatively standard physical activity to significantly increase breath rate. For example, the three-minute run could be done again. The physical education teacher would be an excellent resource for this activity.

3. Immediately upon conclusion of this physical activity, have the students sit and count their breath exhalations for one minute. Record this number.

4. Have them remain seated for five minutes. Again, count exhalations for one minute and record the number.

Charting Results

Results of the above measures need to be recorded so that:

1. students can get some meaningful interpretation of both individual and class fitness;

2. the results could be used in a Fitness Fair at the end of the semester (see Unit IV: "Unit Product").

A class evaluation of blood pressure could display readings that fall above and below the normal range for 14-year-olds. Remember, males and females need to be evaluated separately.

Normal BP range for 14-year-old boys: 100/60 to 143/90
Normal BP range for 14-year-old girls: 99/60 to 140/90

The primary concern of the pulse recovery chart should be to note the number of students whose pulses did recover to the initial resting rate within five minutes after exercise, and to note those who did not recover within that same period.

The breath recovery results can also be evaluated as described above. However, the rate at which both pulse and breath recovers during the five-minute period and beyond is also an important health indicator.

Suggestions

--As with other KEY ACTIVITIES, this fitness profile activity also generates the greatest motivation for learning if students are given the opportunity to do as much as possible of the prescribed procedures. Though you may require initial assistance from a health professional, an important aim of the activity is for students to measure their own fitness (even if the results are not entirely accurate). So, try to avoid a situation whereby either the teacher or the assisting health professional does most of the work.

--To make this activity meaningful to the students throughout the semester, it is crucial for them to implement a fitness program. This program could address nutritional changes, weight loss, general fitness level, or any number of other options that students feel would best fit their personal health and/or fitness needs. Therefore, when doing the physiological assessments prescribed above, keep in mind that results need to be recorded for possible later comparison with similar assessments after students have engaged in a fitness program.

--More detailed instructions and charts to aid in this KEY ACTIVITY can be found in Appendix 4: "Measuring Fitness of the Body's Transport and Respiratory Systems."

ALTERNATIVES AND/OR FOLLOW-UP ACTIVITIES

1. Have the students, as a class, discuss and list on the chalkboard or overhead projector the important areas of physical fitness (i.e., strength, endurance, diet, etc.). Have them include special considerations of various age groups.

Invite a health professional to discuss with the class the importance and nature of physical fitness; topics should include special considerations of the teenage years, the importance of diet to fitness, etc.

Following the class discussion and guest presentation, have each student assess his own fitness level and identify areas he needs to improve upon.

2. Divide the class into four groups; have each group select one person to represent their group in a fitness-appraisal exercise. The group representative should be selected for his or her ability to:

   a. run one-half mile in the shortest time;

   b. recover after a five-minute walk/run in the shortest amount of time (which is determined by taking a 15-second pulse and multiplying by 4);

   c. bend forward and touch palms to floor, holding for five seconds;

   d. do the most sit-ups in one minute.

   Have the representatives leave the class and perform the above fitness measures. When they return, decide who performed best on each measure and decide if an overall winner can be chosen. Have the class discuss with the participants why they did or did not do well on each measure. Factors may include past or present athletic experiences, family background, general body type, etc.

3. Have each student contract a program of physical fitness improvement (see Appendix: "Designing Student Contracts"). Refer to Kenneth Cooper's books on aerobics for suggestions; the students can also read this material.

KEY ACTIVITY 10: Monitoring Personal Nutrition

Students will begin this KEY ACTIVITY by comparing the school lunchroom meal to a bag lunch and to a fast-food lunch. After a day's comparison involving a simple, three-way analysis, students will then look at their personal nutritional habits and draw some conclusions as to how these habits relate to and effect the larger aspects of their general health and fitness.

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Data Collection

1. Divide the students into three groups. Have one group record the lunch served in the lunchroom for one day. Have one group record the lunch brought from home by a member of the group. And have the last group pretend to order from a fast-food restaurant and record that lunch. Each set of recordings needs to indicate each food served in the three types of lunches, and to include an estimate of the amounts. Condiments such as catsup should also be recorded.

2. Using charts obtained from the Home Economics teacher, have each group analyze their lunch according to:

   a. recommended daily servings from the four basic food groups;

   b. recommended daily allowances for five nutrients: calcium, iron, vitamin A, vitamin C, protein;

   c. total energy, or calories.

   Using these three parameters, a comprehensive picture of the value of each type of lunch should emerge.

3. After the lunches have been analyzed, have the students think about and discuss the following questions:

   a. What happens when you take in more energy (calories) than you burn up?

   b. What advantages or disadvantages are there in taking lots of vitamins?

   c. What food surprised you by containing more nutrients than you expected? less nutrients?

   d. Why is it important to have foods from all four food groups?

   e. What do people mean by the term "junk food"? "health food"?

4. Using the same format as in #2, above, have the students conduct a personal nutritional assessment of their food intake over a three-day period. (Again, consult with the Home Economics teacher for appropriate charts for recording food intake. The

Home Economics teacher might also want to help the class with recording techniques, as well as reviewing basic food groups, nutrients, RDA's, etc.)

Data Analysis

1. Have each student analyze each of his or her meals for nutritional balance. Some initial instruction on the teacher's part regarding food groups, minerals and vitamins, physiological needs, etc., will be needed. Stress the additional demands of the adolescent body.

2. Have each student analyze their total dietary profile for trends, deficiencies, etc.

   a. What meals do you need to improve on to obtain proper balance?

   b. What area(s) of your total diet need attention (for example: fewer sweets, more fruit and vegetables, lower caloric intake)?

Conclusions

1. Describe three areas of weakness in your current diet.

2. What implication should these weaknesses have in terms of your health and fitness?

3. List three changes you could make to improve your diet.

Suggestions

--The activity can be shortened to less than one week, if desired; however, for best results at least one week should be devoted to data collection. Whatever length of time is employed, accurate and complete recording of data should be stressed to the students.

--Resource personnel can be invaluable in this activity; for example: home economics teachers, medical professionals, school lunchroom staff, etc.

--The caloric intake monitoring will require the student to have some basic understanding and information pertaining to caloric values of different foods and to keep a careful record of amounts consumed. You may wish to consult a good nutrition reference book. And careful record keeping should also be stressed for nutrient evaluation.

--The following articles might prove helpful:

"Computer Games for Teaching Nutrition" by C. O'Hayan, et al., in the October-December 1980 issue of the Journal of Nutritional Education.

"Nutrition Across the Curriculum" by C. Cramer in the Spring 1981 issue of Instructor.

ALTERNATIVE AND/OR FOLLOW-UP ACTIVITIES

1. Have the students rank in order of highest to lowest caloric needs the following people:

   a. a 10-year-old male
   b. a 60-year-old female
   c. a pregnant 15-year-old female
   d. a 75-year-old male
   e. a 40-year-old male
   f. a pregnant 30-year-old female
   g. a 16-year-old male

   Show the film, "Food for Life." After the film, have the students make any changes in the rankings of their original list. Discuss why they made these changes.

2. Have each student select his or her ten favorite foods. Visit a grocery store and have one group of students make a list of all the chemical additives that are in the foods on their lists. Have another group make a list of all the foods that contain mostly empty calories. Have each group report on their survey and make some conclusions regarding nutritional benefits.

3. The student will make a contract with the teacher to become knowledgeable about wild edible plants in his area. This might include exploring and collecting the plants, learning various plant uses, and preparing a meal that is esthetically pleasing as well as nutritious. (See Appendix: "Designing Student Contracts.")

KEY ACTIVITY 11: A Community Environmental Quality Index

This Activity is designed to demonstrate to students the important connection between environmental health and human health.* Also, you may find that it provides an excellent opportunity to emphasize the perspective that, in addition to caring about the health of human beings, health care should involve caring for the health of the land and its creatures as well.

At this point in the semester, students should already be familiar with and interested in a range of environmental topics. If this is not the case, you may need to begin the activity by heightening student interest in the local environment. Some suggestions for accomplishing this include, 1) having students attend or participate in a public meeting about some local environmental controversy; 2) taking a field trip to include visits to several representative features of the local environment (a park or forest; a municipal incinerator or industrial smoke stack; a sewage treatment plant; etc.); or 3) inviting a knowledgeable and interesting speaker to discuss local environmental issues. And there are other ways to increase student interest, some of which may be more appropriate for your situation.

This KEY ACTIVITY is outlined here in general terms--specific concerns and procedures will depend largely upon the situations in your school and community.

Procedure

1. Set up student teams to study major aspects of the local environment. (These teams can cover many areas but should at least include the environmental components of water, air, wildlife, and forests). Let students select the team most interesting and challenging to them.

2. Have each team devise their own study strategy, to include questions they will be most concerned with, where they will search for information, and how they will proceed.

3. Have the teams go into the field and dig for facts about the environmental components they are studying. They should document their findings by collecting any official reports, taking pictures, using tape recordings, etc.

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* The design of this unit is taken largely from Gross and Corse, 1977.

4. Each team is allowed to organize and present their findings to the class. If possible, this presentation should include a team-produced slide program about their topic as it related to conditions in the local community. This slide show or picture display could also be presented at a Fitness Fair.

Suggestions

--This activity will likely be conducted primarily outside of class. It may, therefore, be helpful if each student team has early contact with agencies or organizations with conservation responsibilities related to their study topic. Such resources include the U. S. Forest Service, the U. S. Soil Conservation Service, environmental organizations such as The Alabama Conservancy, The Sierra Club, The Audubon Society, the local water quality authority, and the local game warden.

--Periodic class discussion and team progress reports will help to keep students motivated, as well as allowing student teams to occasionally invite their own outside speakers, organize their own report about some major issue or finding, or plan a debate about a local environmental issue.

--This activity can be short and simple or very involved. That choice is up to you, the teacher, and is a function of available time and the enthusiasm you can generate among students. In either case, ensure that each team devises an investigation that is sound and feasible. Take care, however, not to do the actual planning for students--learning will be greater if students experience most of the thinking and discovering on their own.

--Keep in mind that the results of these investigations can be organized into a general environment/health slide program for use in an end-of-the-semester Fitness Fair.

ALTERNATIVES AND/OR FOLLOW-UP ACTIVITIES

1. Invite a citizen conservation group to show a film or slide show about environmental concerns in your region. Organize the event so that students have prepared questions beforehand and pursue answers during and after the showing.

2. Have students divide into teams to investigate a local environmental controversy. Have them identify several knowledgeable people on either side of the controversy and pursue an in-depth

interview with each to gather information on the various arguments and views associated with the controversy. Finally, have individual students assume the role of the different people who were interviewed and conduct a role-play debate over the issue.

3. Let individual students contract to do an environmental exploration on the topic of their choice. Possibilities for such an exploration are numerous. For example, a student could investigate the school water supply by locating its original source, tracing its route to the school, and measuring water quality at the different stages along the route. On the other hand a student might choose a broader topic such as attempting to photograph each endangered plant or animal species in the county. (See Appendix, "Designing Student Contracts.")

UNIT PRODUCT

As a result of the KEY ACTIVITIES in this unit, student investigations should provide both a greater awareness of local environmental conditions and a concrete picture of class fitness with respect to several body functions.

The Unit Product, therefore, should consist of organizing these findings into a meaningful picture. Community environmental information should be organized and presented by means of a slide or picture display with narration. Class fitness data should be compiled and displayed showing individual and/or class comparisons with fitness norms for the appropriate age group. Keep in mind that this Unit Product can serve as part of a ~~Fitness~~ Health Fair.

C. Put together an exhibit showing the history of the county/community using photographs, memorabilia, small antiques, gadgets, etc. The display could also be an aural display containing tapes and/or transcripts of oral histories, music (both vocal and instrumental), tall- or folk-tales as examples of story-telling, and so forth.

D. Write and perform a play. The students could create roles based on life in the community long ago.

Some of these suggested projects fit better into an English curriculum and some are more pertinent to Social Studies.

Also, more than one project could be undertaken in a class; the students could be divided into groups based on their selection of the project which they find most appealing.

SA28. English: Nature Poetry

Have the students produce poems using nature as the basis for theme and subject matter.

One approach has the students choosing an aspect of nature to write about, for example: trees. Their poems would be written like this:

1. Have the students write two descriptive words about trees.

2. Next, write three action words about threes beneath the descriptive words.

3. Then, write four or five words about how trees effect their environment and their lives.

4. Under this, write on word that sums up everything about trees.

Upon completion of this task, the students will have written a rhymetric poem about trees.

Another approach: Present examples of good nature poetry, to be used as models by the students. Poets like Gary Snyder, Robert Frost, Carl Sandburg, Elizabeth Bishop, and William Stafford have written many good poems to use as examples. Also, this would be a good opportunity to try haiku poetry with the students. Try to allow the students to examine their relationship with nature. How do they feel in a natural setting? What are their thoughts and feelings when they are in nature?

SA29. English: Environmental Vocabulary

Have the students learn the meaning of words that are commonly used by those who write or speak on the subject of environment, ecology, and conservation. The words should then be used in written sentence exercises.

SA30. English: Environmental Essay

After the students have participated in KEY ACTIVITY 7, have them write a description of the region they visited as it will appear in another 25 years if man continues to abuse nature at the present rate.

SA31. English: Another Environmental Essay

Have the students write a reflective essay in which they discuss their thoughts and feelings regarding KEY ACTIVITY 7. The KEY ACTIVITY experience could be dealt with in an general manner, or a specific aspect of the experience could be examined. Guide the students in discovering a topic to write about which allows them to look at the KEY ACTIVITY experience in terms of what it has taught them and how their perception of the natural world has been broadened.

SA32. English: Environmental Play

Have the students write and perform a play concerning man's activities and their effects upon the environment. Activities should include those that have both good and bad effects. By performing the play, the participants and the audience can learn effectively.

SA33. Social Studies: Vegetation Zone Maps

Construct a map using any interesting medium such as watercolor, representative materials (oak leaves, pine needles, etc.), a college, and so forth. These maps will show the vegetation zones in Alabama before and after white settlement of the area. Discuss how man has altered the landscape and the effects this has had on the environment.

SA34. Social Studies: Early Alabama

Have the students read some early descriptions or accounts of Alabama, such as Bartram, Swanton, or Adair. Have the students pay special attention to the culture and life styles of the Indians and early European forts and

settlements; also, look at how these people interacted with their environment. Students can also look at vegetation, transportation systems, and waterways.

SA35. English and Social Studies: Controversial Environmental Issue

Choose a controversial issue which relates directly to KEY ACTIVITY 7. Make a presentation on the issue which might include a film, news story, article, or verbal description that provides adequate understanding of the issue. Then propose a position statement on the issue (e.g., "Strip mining should be abolished because it is too detrimental to the environment").

Direct the students to prepare 3 x 5 cards indicating whether they are "for," "against," or "neutral" on the issue. They pin these cards on themselves. The students can then circulate around the room trying to persuade other students to change their positions.

Make sure the students understand these ground rules:

1. Nonargumentative persuasion is the rule. Logic and solid information should be used to sway other students' positions. There should be no physical actions or threats.

2. Individual students may choose to maintain or change their opinions.

3. Individuals may choose to pass during this discussion time without judgment by the teacher or other students.

After 15 or 20 minutes, call the group back together for discussion. Begin the discussion phase by having everyone identify his final position. Discussion might include:

What arguments or points were most influential in getting students to maintain or change positions?

What attitudes of persuasion were not effective, regardless of logic?

Were any more appropriate alternate solutions to the problem or issue put forth?

Was the information available on the issue adequate for this exercise to be successful?

What else should have been available?

You might want to try several rounds of this activity using different local issues. If there is sufficient interest, the class might choose to become actively involved in this issue in the community. And a theme paper can be written about this issue by each student, once the class has thoroughly discussed his position.

SA36. Math: Soil Erosion

Consult local Soil Conservation Service for the formula for soil erosion. Identify an area on school grounds where erosion is occurring or might occur. Measure its dimensions and utilize the formula to compute the potential erosion.

SA37. Math: More Soil Erosion

Have students individually do a mini-study using the above formula on a disturbed site near their home, farm or some other local spot. Working with the Soil Conservation Officer the student will calculate not only the erosion factor, but amounts of vegetation needed to provide ground cover.

SA38. English: Dictionary of Dialect and Slang

Have each student write a small dictionary of dialect and slang consisting of 50 words in alphabetical order. Label each word "dialect" or "slang"; define each word; name its part of speech; and use the words in sentences. One dictionary could also be produced collectively by the entire class.

SA39. English: Writing as a Process

Take time to allow the students to view writing as a process which runs through a number of stages, from initial thought to finished draft. When students understand the writing process, the papers they produce become much sounder and competent. One of the key words in the writing process is "discovery." As a student learns to appreciate the fact that many times it is through the process of writing that one discovers the essence of what he is attempting to write about, the student becomes a much better writer. The process of writing involves a number of steps which can be presented to the class roughly as follows:

1. freewriting/jotting (the initial discovery step)
2. finding a focus (putting limits on the discovery)
3. first draft (developing the discovery)

4. conferences (teacher-guided discovery)

5. post-conference draft (prior to grading)

6. revision (after grading and teacher evaluation)

SA40. Social Studies: Fitness Debate

Sponsor a debate on whether or not more government funds should be spent to increase awareness and to improve the general level of personal fitness.

SA41. Social Studies: Carbon Dioxide Emissions and Health

Modifying the procedure outlined in BSCS, p. 652, "Measuring Carbon Dioxide Concentration of Human Breath," test the carbon dioxide level emitted from several different automobiles. Discuss the implications that high carbon dioxide emissions have for health, both human and environmental.

SA42. Social Studies: Alabama Waterways

Much early colonization, trade settlement, etc., in Alabama took place because of the naturally occurring locations of water bodies, rivers, and other water-oriented features. Initiate a discussion of this concept. Students should pinpoint major water routes, settlements, bodies of water, etc., and explain why there is a relationship between settlement and the water body. Further discussion may bring out the importance of water bodies to the local community, its economy, recreation patterns, etc.

SA43. Social Studies: Landmark Trees

Landmark trees in a community can be used as a reference to history. Some trees might have achieved local fame, e.g., council grounds for meeting with Indians and settlers. Other trees might relate to historical events and dates. Students could relate some historical events to a tree's growth period. Having students interview local historians or older people knowledgeable about such events can enhance this experience. A class discussion can also be initiated: What landmark trees are located in the community? What events took place beneath or on them? How old or how big was the tree when World War I took place? the Civil War? when men landed on the moon? What's being done to protect or preserve these trees?

SA44. English and Social Studies: Effects of Air Pollution

A few different exercises can be undertaken concerning the issue of air pollution and its direct effect upon the environment.

Students can discuss some of the human diseases associated with air pollution and the accompanying social costs of these diseases:

1. allergic disorders
2. acute upper respiratory infections
3. emphysema
4. bronchitis
5. heart disease
6. circulatory diseases
7. respiratory diseases

Discussion can also revolve around the pollution hazard associated with various occupations such as coal mining or asbestos manufacture.

Further discussion could be held on the subject of air pollution episodes and their relations to heart attack and the death rate.

Themes could be written on any of the above areas of discussion on the subject of air pollution and its adverse effects.

SA45. Math: Mean, Median, and Mode

Use data collected in KEY ACTIVITY 8 to have students compute the mean, median, and mode for each of the measures for which this could be appropriate. Divide the class into small groups and determine how the class averages compare with the norms for their age group.

SA46. Math: Graphs

Using the above data, have the class do simple graphs to compare the class averages to the norm.

SA47. English: Foods Essay

Have the students write an essay on foods which are hunted, fished, gathered, or grown.

SA48. English: Nutritional Interviewing

Have the students interview parents, grandparents, or other relatives for nutritional information which can be used as the basis for a theme or an article. Questions could concern favorite foods, family recipes, and changes in foods and diet over long periods of time. (A useful article to use in this exercise: Singer, E.A. "Folklore for Nutritional Education," Journal of Nutritional Education, 14:12-13, Mr '82.)

SA49. English: Dumping Trial

Most doctors and health professionals agree that breast feeding of infants is far superior to bottle feeding. Human milk contains all the nutrients necessary to sustain the infant through the first six months or so of life. Breast feeding is particularly important in Third World countries where bottles and equipment are seldom sterile and can pass on diseases while providing an inadequate diet which lowers the infant's resistance to infectious diseases. Nonetheless, baby-formula manufacturers continue to increase their markets (and their profits) all over the world. Also, inferior products which are not allowed to be sold in the U.S. are often dumped in less-developed countries.

Divide the class into courtroom personnel: judge, jury, defense and plaintiff attorneys, defendant, witnesses, etc. The defendant is a multi-national corporation. The plaintiff is a mother from Zimbabwe; after being persuaded to feed her child on formula, this mother lost her child. The baby died because the formula was contaminated with bacteria. The formula had been taken off the shelves in the U.S. by order of the FDA. Stage a trial, present evidence pro and con, and come up with a verdict. Make sure the two attorneys in this exercise use all the ethical and moral issues pertinent to this "case" in their arguments.

This exercise could also be suited to a long essay assignment.

SA50. Social Studies: Transport Systems

Have each student bring in a food produced outside the state. Discuss the systems operating to get that product in to Alabama (e.g., transport systems, state and federal regulations, technology).

SA51. Social Studies: Ethnic Meal

Prepare an ethnic meal such as soul food, Italian food, Chinese food, etc. The meal can either be prepared at home by the students and brought to class, or it can be prepared in class using electric skillets, hotplates, or other small appliances. The students could also prepare an Indian meal serving only those foods native to the New World.

SA52. Social Studies: Meat

Conduct a discussion about food and nutrition and how diet is effected by meats. (Wild game meat is high in protein and low in fat, while some domestic meats may not have these characteristics.) If possible, refer to U.S. meat consumption data. Have students write to state fish and game department for harvest statistics for deer and other game species.

If possible, cook wild meat in very small portions so each student can have a taste if they wish and if it does not violate their religious precepts.

Further discussion may include questions such as, "Are there any edible wild game species on the school site?" or, "Are these species in the area?" or, "Are game animal populations going up or down?" or, "What effect does hunting have on game species?"

SA53. English and Social Studies: Global Malnutrition Essay

While grain and other foodstuffs rot in U.S. silos and warehouses, people in Third World countries subsist in a constant state of malnutrition. Some people die outright from starvation, but most are carried off by infectious diseases. A synergistic relationship exists between malnutrition and infectious diseases--being malnourished makes one more susceptible to infectious diseases and vice versa.

Have an essay contest in which each student writes on the moral and ethical issues involved in this global tragedy. Remember that feeding surplus U.S. food would help alleviate the problem; but due to world political affairs and economics, it is apparently impossible to use surplus U.S. foods to feed starving Third World populations. Discuss some possible solutions, especially economic stratagems, legislation, treaties, and such which the students might devise if they were one of the future leaders of our country. Use references, sources, and private opinions on this issue in the discussion, which the students can incorporate into their writing.

SA54. Math: Quantity of Food

With assistance from the lunchroom manager, determine standard serving size per student (in ounces) for each item served. Have students multiply this amount by the number of students being served to get the total quantity of food served in ounces. Convert the ounces to more meaningful measures (pounds, gallons, dozens).

SA55. Math: Weight of Food Waste

Finally, have students meet again with lunchroom personnel to secure their help and cooperation with this activity. Tabulate total weight of food prepared for lunch on a particular day. Collect all the food waste for that day. (Make sure there is a separate trash can for paper products and only food goes into the garbage trash cans.) Weigh the cans that contain the wasted food. The students might choose to weigh only one can and multiply by the total number of cans. Find the amount of food wasted that day and what percentage it was of the total amount prepared.

SA56. English: Yet Another Environmental Essay

Have the students write a theme describing an environmental experience they have had: KEY ACTIVITY 10 or a related experience, such as the beauty of the outdoors, the abuse of nature by man, or the waste of natural resources.

SA57. English: Environmental Change

Each student chooses an environmental issue of particular interest to him. He then analyzes a few options open for writing about that issue. Here are some suggested options:

1. Write a letter to the editor of the local newspaper.
2. Write to a business or company.
3. Write an elected or appointed governmental official or agency of government.
4. Send a letter of support to someone doing something the student admires.
5. Write an organization working for the student's cause.

After choosing a writing project, each student makes a list of at least five needed changes regarding that issue to serve as a beginning for the project.

SA58. English: Environmental Quality Articles

The students can write articles on environmental quality topics for publication in the school or the local newspapers.

SA59. Social Studies: Litter Analysis

Have the students select a small, delimited area (e.g., so many feet of roadside). The students shall proceed to pick up all the litter they find there. Analyze the types of articles found and see if any conclusions can be drawn about the people (i.e., society) who left this stuff behind. Suggested ways of analyzing the litter:

1. By material (paper, glass, plastic, etc.)

2. By function (food wrappers, containers, etc.).

Many other categories and classifications can be made.

SA60. Social Studies: Poisoning

Have each student bring to class a label from a product which is dangerous if ingested. Each student could be required to report, either orally or in writing, on the procedure recommended on the label to be followed in the case of poisoning. The student would then report the procedure recommended by health officials and poison control centers. What are some of the social and legal reasons for any discrepancies found in the recommendations?

SA61. Social Studies: Hunting as a Management Tool

Assuming that some big fame (mainly deer) populations may reproduce beyond the carrying capacity of the land, ask students to discuss practical and unpractical methods of keeping populations in balance. What results occur if balance is not maintained?

Discuss the pro and con arguments dealing with hunting as a management tool. Discuss the feasibility of alternative population control methods. Include financial and administrative possibilities.

SA62. English and Social Studies: Industrial Location Debate

Given the situation presented below, the students should try to decide what they would do if they were faced with such a situation. They should try to be as realistic as possible in their choice of actions.

Situation

A profitable industry wants to locate in a small town because a river running on the outskirts of the town would be an easy and inexpensive (to them) way to dispose of industrial waste. The town has many poor people who would be willing to work for just about any wage. The industry would be a boon to the town and increase its economic standing in the state.

You (the student) have been invited to attend the town council meeting and voice your opinion about the location of the industry. You are aware of the possible pollution of the river which currently provides clean drinking water, a site for recreational activities, and homes for many animals, fish, and waterfowl. However, you also realize that the industry would provide better incomes for many poor families and increase the standard of living for the community. You are personally acquainted with poor families who desperately want the industry and the opportunities it will bring.

Questions to Consider

1. Will you take a stand for or against the new industry at the council meeting?

2. Consider the cost of losing the river as a source of drinking water, recreation, and wildlife refuge, and the expense of cleaning it up after it has been polluted.

3. List arguments you will use to help persuade fellow citizens to see your point of view.

4. Consider the plight of the poor in the community.

5. Will your relationship with any of your friends be effected by your decision?

6. How will you feel toward those who oppose you?

7. Is there any possibility of a compromise solution?

The class could debate these issues with one team for the industry and one against it. Each team could present its arguments before a panel which represents the town council. The council job would be to decide the best, long-term solution for the entire town.

To develop writing skills, the students could draft written proposals addressed to the council members on the issue of whether or not the industry should be allowed to build their plant.

SA63. Math: Population Growth Computation

The present world population growth rate is approximately 2% per year. Given this rate and the present world population of approximately 4.5 billion, have students calculate how many years it will take for the world population to double. Next, have them do the same analysis for our Alabama population which is approximately 3 million. If this rate of growth (2%) would increase substantially (from migration, rapid economic development, etc.) to say 5%, how long would it take the population to double?

Let the class graphically display these measures.

SA64. Social Studies: Group Perceptions

Members of a group often have different perceptions of the characteristics of that group from those held by outsiders. Ask the students: What is your own image of the racial, national, religious, and social groups to which you belong? How do non-members perceive these groups? Have the students write an essay, or hold a class discussion, in which a comparison is made between these two images; attempt to account for the differences in perception.

SA65. Social Studies: Professional Language

It is interesting to perceive the different types of language used by professionals. Have the students watch episodes from three different television shows featuring doctors or persons in a health-care-related occupation. Then, the students should write essays or discuss as a class, analyzing the professional language used in these shows and commenting on the general accuracy of the language and the similarities among the shows (e.g., "Trapper John, M.D."; "Quincy"; "St. Elsewhere").